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■ research article

Developments in national climate change mitigation legislation and strategy

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The results are presented from a survey of national legislation and strategies to mitigate climate change covering almost all United Nations member states between 2007 and 2012. This data set is distinguished from the existing literature in its breadth of coverage, its focus on national policies (rather than international pledges), and on the use of objective metrics rather than normative criteria. The focus of the data is limited to national climate legislation and strategies and does not cover subnational or sectoral measures. Climate legislation and strategies are important because they can: enhance incentives for climate mitigation; provide mechanisms for mainstreaming; and provide a focal point for actors. Three broad findings emerge. First, there has been a substantial increase in climate legislation and strategies between 2007 and 2012: 67% of global GHG emissions are now under national climate legislation or strategy compared to 45% in 2007. Second, there are substantial regional effects to the patterns, with most increases in non-Annex I countries, particularly in Asia and Latin America. Third, many more countries have adopted climate strategies than have adopted climate legislation between 2007 and 2012. The article concludes with recommendations for future research.

Policy relevance

The increase in climate legislation and strategy is significant. This spread suggests that, at the national level, there is some movement in reshaping climate governance despite the relatively slow pace of global negotiations, although the exact implications of this spread require further research on stringency of actions and their implementation. Asia and Latin America represent the biggest improvements, while OECD countries, which start from a high base, remain relatively stagnant. Implications of regional patterns are further refined by an analysis by emissions, which shows that some areas of low levels of legislation and strategy are also areas of relatively low emissions. A broad trend toward an emphasis on strategies rather than legislation, with the significant exception of China, calls for enhanced research into the practical impact of national non-binding climate strategies versus binding legislation on countries' actual emissions over time.

Keywords: climate change; domestic policy instruments; national policies; policy measures; public policy

1. Introduction

The debate on the architecture of a future global climate agreement has been complemented in recent years by growing empirical attention to the shifting policy context within national jurisdictions.

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The comparative politics literature, for example, explores why national governments have implemented a variety of national policies aimed at climate protection (Bailey & Compston, 2012; Compston & Bailey, 2008; Harrison & Sundstrom, 2007, 2010; Held, Roger, & Nag, 2013) and the shared objectives and concepts that define them (Hollo, Kulovesi, & Mehling, 2013). Country studies examine specific instances of experimentation with national climate policy, e.g. Sugiyama and Takeuchi (2008) for Japan, Tsang and Kolk (2010) for China, Atteridge, Shrivastava, Pahuja, and Upadhyay (2012) for India, La Rovere (2011) for Brazil, Rabe (2011) for the US, Wurzel and Connelly (2010) for the EU, and Weidner and Mez (2008) for Germany. Other bodies of literature seek to compare these efforts across countries in order to draw a composite global picture of emergent climate policy at the national level. Without prejudice to ongoing debates over the relative merits of 'top-down' versus 'bottom-up' approaches to climate policy (Dubash & Rajamani, 2010; Hare, Stockwell, Flachsland, & Oberthür, 2010; Rayner, 2010; Schreurs, 2008; Streck, 2012; Winkler, Höhne, & den Elzen, 2008), the apparent proliferation of national-level policies and actions around climate change appears deserving of further study and attention.

The intention of this article is to add to the emergent literature on whether and how transitions to a low-carbon economy are possible in different national contexts, by systematically documenting the extent of nationally binding climate legislation and non-binding climate strategies that have been put in place in recent years, specifically from 2007 to 2012. The particular focus of attention is on national mitigation legislation and strategy rather than subnational or sectoral approaches. This work is based on a data set compiled predominantly from government sources in order to characterize and analyse the range of national climate action. This data set enables examination of the spread of different forms of climate action, which is presented in a variety of ways, in order to draw conclusions about the spread of climate policy at the national level and its implications.

This data set is distinguished from other sources by its breadth of coverage. Instead of an in-depth analysis of a select few countries, the aim is to provide an overview of national-level climate policy in almost all UN member states. In addition, instead of reporting on country pledges within the United Nations Framework Convention on Climate Change (UNFCCC) process, as many studies do, the emphasis here is on national policy processes, which are explicitly categorized into two discrete categories. The intention is to focus not on what countries say they will do in the international process, but instead to turn the spotlight on what they are actually doing within their national borders.

Section 2 situates this research in the context of other, similar projects, and explains the commonalities and differences. Section 3 makes the case for why attention to climate laws and strategies are a salient metric to track, and explains how the approach followed here is different from and complements other tracking studies. Section 4 describes the methodology. The results are presented in Section 5 and discussed in Section 6.

2. Survey of studies to track national climate policy

As national climate policy has proliferated, so have the range of efforts to track these policies. Doing so, however, is a daunting task for a variety of reasons. First, data are entirely decentralized by country, making the task of compiling an extensive database challenging. Second, because climate policy is a relatively recent field and is undergoing a phase of experimentation, there is a wide range of approaches

and policies currently being attempted – including policies that may not be defined as climate policies but have an effect on climate outcomes – raising definitional issues and questions of comparability across countries. Third, measuring the actual effectiveness of policies raises an additional set of challenges, frequently requiring in-country analysis and raising the bar for effective cross country comparison. All three challenges need to be met, but, in practice, it is extremely difficult to meet them all in any one particular database.

Multiple efforts have been undertaken, each of which brings a particular focus, as summarized in Table 1. The last column, relating to a climate change mitigation legislation and strategy survey, provides a summary of the attempt in this article to address the challenges identified above.

As Table 1 indicates, some studies emphasize wide country coverage, while others choose a broad scope but for a smaller set of countries. Most of the existing studies cover only a subset of countries, in many cases based on the justification that a large proportion of global emissions is covered by scrutinizing a relatively small number of countries.

Studies also differ in whether they assess stringency of policies or benchmark the country strategies against global targets. Efforts to undertake these qualitative judgements allow authors of these studies to produce scorings and rankings across countries. However, these invariably involve a measure of subjective judgement, to different extents. For example, the GLOBE study only compares countries with their own past performance, while other studies make qualitative judgements on the appropriateness of policies, as judged against a range of benchmarks. Two studies rate countries on the likelihood of meeting their self-selected targets ('DB: Global Climate Change Policy Tracker' and 'GHG Emission Reduction Proposals and National Climate Policies of Major Economies'). Two other studies use the overall objective of the UNFCCC to prevent dangerous climate change and break it down to country level using a constructed index ('Germanwatch Climate Change Performance Index') or a generic best practice policy package ('Climate Action Tracker Country Assessment').

3. Rationale and approach

The 'National Climate Change Mitigation Legislation and Strategy Survey' discussed here is distinguished from the existing literature in three important ways:

- First, the survey categorizes climate policy based on relatively few criteria that can be objectively assessed. The intention is to stay clear of normative efforts to judge adequacy.
- Second, the focus is explicitly on national policies expressed in terms of mitigating climate change, and not on energy, forestry, or other sector-specific policies that have the effect of climate mitigation, unless they are explicitly linked to climate mitigation objectives. For example, renewable energy promotion policies in isolation are not included. Moreover, subnational policies are also beyond the purview of this study.
- Third, the survey includes nearly all countries in the UN system, because of the priorities above. This avoids biases introduced through partial sampling.

The result is a database that minimizes normative judgement, explicitly focuses on dedicated efforts to tackle climate change mitigation at the national level, and provides very large coverage. Assessing

TABLE 1 Overview of efforts to track national climate policy

		Germanwatch Climate Change Performance Index (2012)	DB: Global Climate Change Policy Tracker (2012)	Climate Action Tracker Country Assessment (2012)	GHG Emission Reduction Proposals and National Climate Policies of Major Economies (2012)	National Climate Change Mitigation Legislation and Strategy Survey (this article)
	GLOBE Study (2013)					
Central question	What climate change legislation, regulation, policies, and decrees exist in large emitting countries, and how do they compare against the past in each country?	How do countries compare on their climate change performance in relative terms?	What are the best in class climate and energy policy regimes and what is their abatement potential?	What are the international climate change-related pledges made by countries and their related policies? Are these sufficient to restrict emissions to a 2 °C pathway?	What is the effect of most important policies on emissions?	What national framework of climate legislation and policy is in place and how has it evolved between 2007 and 2012?
Method	Qualitative review of relevant legislation and policies in select countries	Assessment based on a composite index composed of emission levels, development of emissions, current and projected levels of renewable energy and energy efficiency, and global and national climate policy; quantitative data are supplemented with expert interviews	Qualitative analysis of climate and energy policies and mandates to identify transparent, long-lived, and certain policies; the effects of these are modelled to provide a projection of future global emissions and identify best in class policies	Collection of data and information on climate policy; semi-quantitative assessment of effectiveness; quantitative evaluation of impact on emissions	Quantitative assessment of impact of top three policies using a variety of methods	Survey of all the UN member states and categorization of national climate action based primarily on official government websites to identify (1) national climate legislation; (2) national climate strategy and coordinating body; (3) neither of the above

Continued

TABLE 1 Continued

	GLOBE Study (2013)	Germanwatch Climate Change Performance Index (2012)	DB: Global Climate Change Policy Tracker (2012)	Climate Action Tracker Country Assessment (2012)	GHG Emission Reduction Proposals and National Climate Policies of Major Economies (2012)	National Climate Change Mitigation Legislation and Strategy Survey (this article)
No. of countries studied	32	58	22	2	18 + EU27 as a whole	193
Scope	National climate and energy legislation, policies, regulation, or decrees	Emission levels, national climate and energy policies	National climate and energy policies, and some subnational policies	National climate and energy policies	National climate and energy policies	National climate legislation and strategy
Assessment of stringency	–	✓	✓	✓	✓	–
Benchmarked against global targets	–	–	✓	✓	–	–
Basis for categorization	Each country benchmarked against its own past performance	Categorization based on index score	Benchmarked against qualitative assessment of likelihood of meeting their own targets	Rating policies against a best practice policy package	Categorization based on quantitative assessment of likelihood of meeting their own pledges	Each country categorized as either (1) climate change legislation; or (2) climate change strategy and coordinating body; or (3) neither of the above
Source	Townshend et al. (2013)	Burck, Hermwille, and Krings (2012)	DB Climate Change Advisors (2012)	Höhne, Moltmann, et al. (2012), Höhne, Hare, Vieweg, and Braun (2011)	Höhne, Braun, et al. (2012)	

^aClimate Action Tracker Country Assessment refer to the CAT *country studies*, as distinct from the CAT analysis of international GHG reduction pledges, which covers a larger number of countries.

the existence of climate legislation and/or policy (even without an assessment of its stringency or of subnational actions) is important for at least three reasons. These are all hard to measure, but can nonetheless be significant.

1. *Enhance direct incentives for mitigation.* The conventional argument for climate legislation or policy is that it may be a necessary, even if not sufficient, condition for the introduction of new policies and instruments that shape the incentives for economic actors in favour of actions that limit GHG emissions. This remains an important argument for some countries, but this logic need not apply in all cases. For example, there may be shifts in energy policy for non-climate reasons, such as energy security or articulated in non-climate terms where political acceptance for explicit climate policy is very low. Nonetheless, climate policy at the national level may be important for other reasons, as discussed below.
2. *Mechanisms for mainstreaming.* Explicit articulation of climate legislation and policies can amplify and enhance sectoral policies that have the effect of climate mitigation by providing a framework and a structure for integrating and incentivizing other relevant policy arenas – energy, transport, urban planning – to address climate change. In other words, mainstreaming climate change as a policy objective is likely to be enabled by overarching climate policy, beyond what disconnected sectoral policies can accomplish in isolation. Well-framed national policies can provide mechanisms to induce sectoral policy makers to consider mainstreaming climate change into sectoral policies.
3. *Focal point for bureaucracies, NGOs, and the private sector.* Climate change laws and policies do not operate only through direct incentives; they have a number of indirect effects. These include creating integrating institutions, changing incentive structures for bureaucracies, generating new sources of data and metrics that affect bureaucratic functioning, generating political opportunities, providing signals to the private sector, providing ‘hooks’ around which civil society can organize and mobilize, and inducing normative shifts in favour of effective mitigation action.

It is important to appropriately understand both the limits and the contributions of this work. This article is limited to an analysis of national climate legislation and strategy. This is not to claim that climate mitigation can only happen in the presence of national climate policy – whether binding or non-binding. For example, there can be substantial policy innovation at the subnational, including municipal, level in the absence of a national framework, as also at the sectoral level. Even more broadly, the article is limited to mitigation and does not cover adaptation and resilience. This focus on mitigation is not intended to signal a primacy of mitigation concerns over adaptation; indeed, in many small vulnerable countries adaptation should probably be the focus.

Keeping these caveats in mind, this article nonetheless argues that there is a great deal to be learnt from compiling and analysing a database of national climate change legislation and strategies, as discussed above. This survey covers one part of the story related to these mechanisms and is intended as a complement to and not a substitute for other studies that directly examine stringency of national effort, benchmark these against global targets, or examine subnational and co-benefits-based actions, and adaptation policies. In summary, the circumscribed purpose of the database discussed here is to fill in a gap in the existing literature – to provide comprehensive coverage of national legislation and strategy that can, potentially, lead to economy-wide incentives, mechanisms for mainstreaming climate change mitigation, and a focal point for normative and institutional change.

4. Methodology

The objectives sought by the methodology described here are ease of application; transparency; consistency; and ease of comprehension. To achieve these objectives, all countries are scored on a three-level grading scheme using the criteria in Table 2. The highest category (1) is applied to cases where there is parliament-approved national legislation (an Act of Parliament or an equivalent process for non-parliamentary states) explicitly aimed at GHG limitation or reduction. Also, included in category (1) are systems where the same effect is achieved by multiple acts covering all relevant sectors; a unitary

TABLE 2 Methodology for National Climate Mitigation Legislation and Strategy Survey

(1) Climate legislation	An act that has been passed by a national parliament, that is in force, and that includes in its title or in its statement of objectives limits or reductions in GHG emissions. This legislation may include a national climate goal, but this is not a necessary condition. If a parliament does not exist, the equivalent government act necessary to pass legally enforceable measures should be used as the benchmark. Not qualifying for this category: • If there is no single overarching act, but multiple sectoral piecemeal acts in place, then a reasoned judgement must be made on whether these add up to a larger strategy. Normally, a single sectoral act only that includes as one of its objectives limiting GHGs would not be counted in the absence of evidence of a larger strategy • An adaptation-only focused act or one that focuses on accounting for emissions alone should not be counted.
(2) Climate strategy and coordinating body	One or more documents or statements passed by a national government to promote climate change mitigation, but not passed by a national parliament or through any other formal lawmaking process, which includes: • Strategy, plan, or framework for climate mitigation that states in its title and/or in its statement of objectives limiting or reduce GHG emissions, AND • A coordinating body charged with developing and implementing the strategy, plan or framework. Not qualifying for this category: • If there is no single overarching strategy, but multiple sectoral piecemeal strategies in place, then a reasoned judgement must be made on whether these add up to a larger strategy. Normally, a single sectoral strategy only that includes as one of its objectives limiting GHGs would not be counted in the absence of evidence of a larger strategy • An adaptation-only focused act or one that focuses on accounting for emissions alone should not be counted.
(3) None of the above	Includes countries that were studied but where no information suggesting climate legislation or strategy as defined above was found, even after a thorough search
(4) Analysis incomplete	Includes countries that were studied, but where categorization was not possible, because e.g. information was not fully traceable, was not public, or was in a language other than those available to the research team.

climate law is not required. Category (1) is distinguished from category (2) by the presence or absence of parliamentary approval, which implies a degree of domestic legal bindingness. National plans, strategies, and frameworks that are not approved by a parliament are therefore designated as category (2). In order to separate category (2) from broad declarations of intent that have no actual effect on government functioning, category (2) must include the existence of a coordinating body charged with developing and implementing further action. Although a coordinating body is not a guarantee of further action, the existence of such a body is at minimum an indication of intent, which is empirically measureable. For category (1) no check was undertaken to ascertain if such a body exists. Countries that did not meet either requirement are categorized as category (3), while those for which data were unavailable are marked as category (4).

The implications of distinguishing between (1) climate legislation and (2) climate strategy and coordinating body are worth exploring further. National legislation is binding on national governments, typically harder to reverse than climate strategies or policies across successive governments, and provides avenues for accountability through judicial processes. Whether these differences between legislation and strategy translate into differential force for the three mechanisms we describe above – enhanced incentives, mechanisms for mainstreaming, and focal point for action – is an empirical

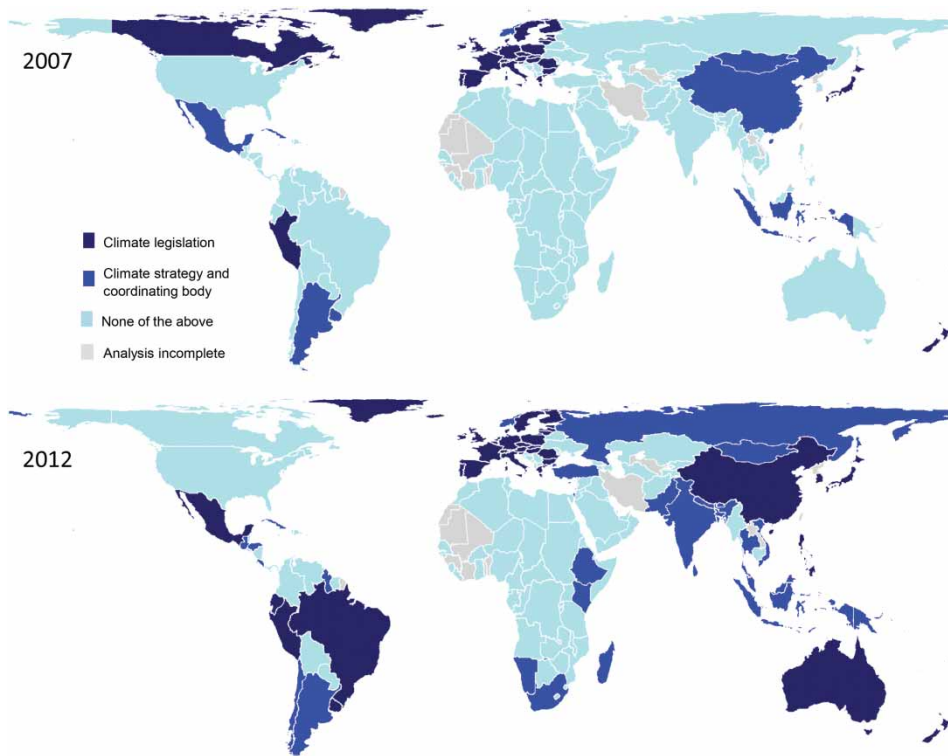


Figure 1 Climate legislation and strategies in 2007 and 2012 (equal area projection)

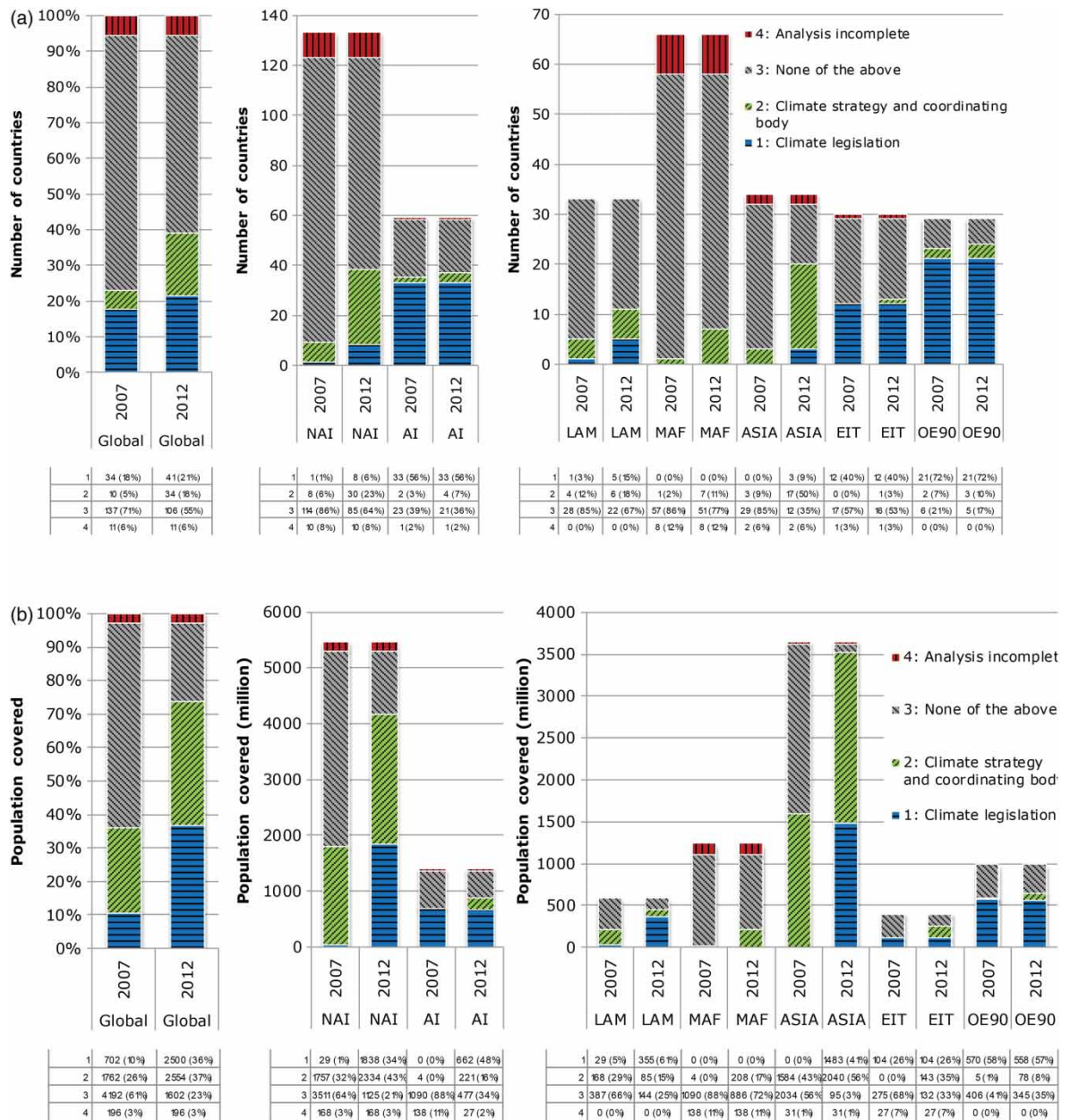


Figure 2 (a) Shares of countries with climate legislation and strategies in 2007 and 2012. (b) Shares of population under climate legislation and strategies in 2007 and 2012

Notes: NAI = Non Annex I countries (developing countries); AI = Annex I countries (developed countries); LAM = Latin America; MAF = Middle East and Africa; ASIA = Asia; EIT = economies in transition; OE90 = OECD of 1990.

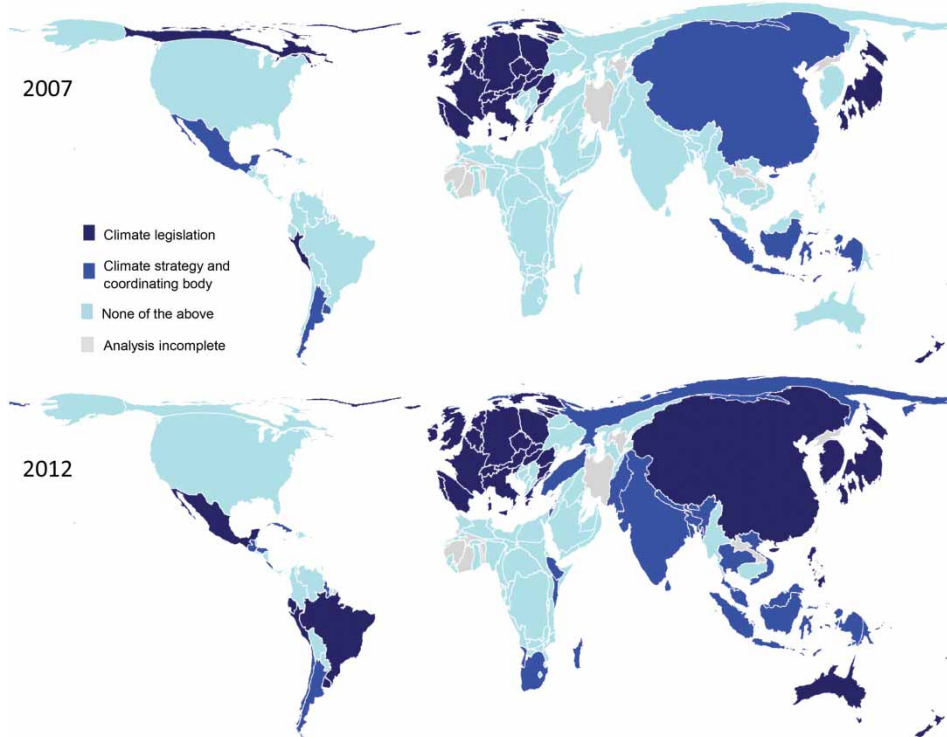


Figure 3 Climate legislation and strategies in 2007 and 2012 (area proportional to GHG emissions in 2010)

question that is flagged in the conclusion. In addition, the interpretation of climate legislation versus strategy depends on national political cultures. The act of legislating may have considerable force in one political culture and less in another. Despite these caveats, this study distinguishes between the two categories because it is likely that the tendency is for legislation to signal greater political commitment and greater impetus to action, and because separating the categories is likely to make this survey more useful as a platform for future empirical work.

To implement this approach, official government websites were analysed, wherever possible, to assess national legislation and policies using these categories. Supplementary information contained in the National Communications to the UNFCCC or information available on the UN agency websites were used to cross-check government sources. Exceptions have been made in cases where the government documents were available on some non-government websites. These categories were applied for two points in time, December 2007 and December 2012. The former is the publication year of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). The interval to December 2012 captures national actions around what is arguably the most active recent period for climate policy, the Copenhagen Conference of the Parties in December 2009.¹ The complete data on the basis of which the analysis below is presented, including categorization, the basis for categorization, and sources, are provided as Supplementary material on the *Climate Policy* website.

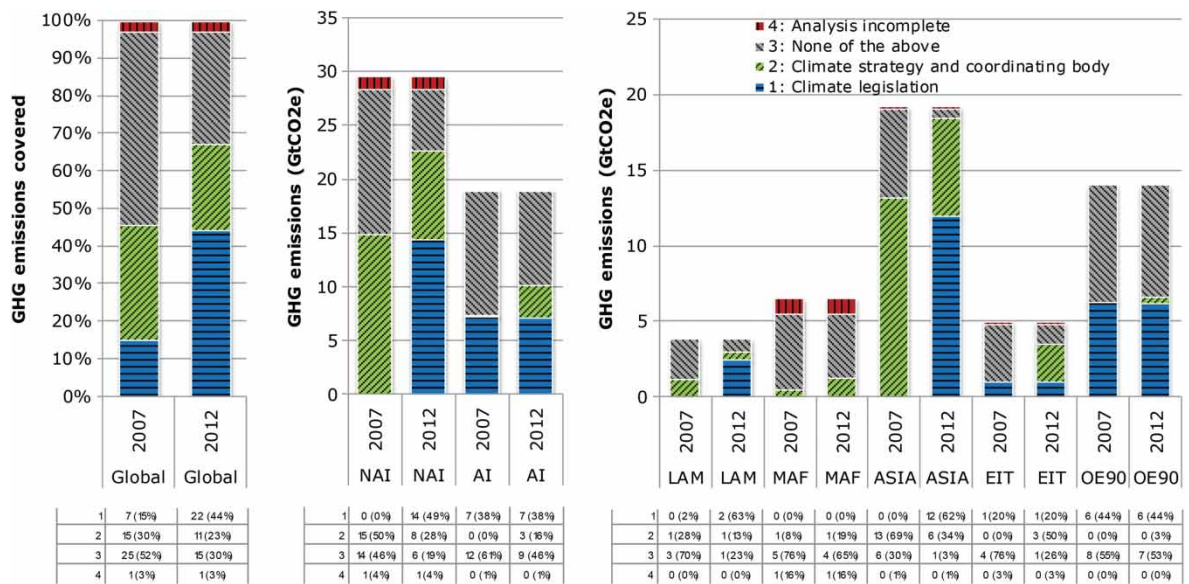


Figure 4 Shares of global GHG emissions climate legislation and strategies in 2007 and 2012

In order to relate the findings to population and emission trends, data were drawn from the EDGAR database.² All data represented here are for all GHGs, all sectors (including agriculture and forestry), using 100-year global warming potentials of the Second Assessment Report of the IPCC. The survey covers 193 countries, out of which coding was successfully accomplished for 180 countries, representing 97% of the global population and 97% of GHG emissions in 2010.

5. Results

Figures 1 and 2 show that the number of countries that have either climate legislation or climate strategy has increased significantly since 2007. By 2012, 39% of the countries studied fell in one of these categories, while in 2007 only 23% did so. There has been a slight increase in the number of countries with national climate legislation (18% in 2007 to 21% in 2012), and a larger increase in the number of countries with climate strategies (5% in 2007 and 18% in 2012). Figure 2 shows that there are also significant regional effects. Additionally, many countries from Latin America, Asia, and 'economies in transition' have adopted climate strategies over this period. The trend is particularly pronounced when the data are reported in terms of population covered. Although the share of the world's population covered by a legislation or strategy doubled between 2007 and 2012 from 36% to 73%, it increased even more significantly from 43% to 97% for Asia (Figure 2(b)). Looking at the number of countries rather than the population, 59% of countries in Asia have either legislation or strategies in 2012 (Figure 2 (a)). This indicates that larger, more populous countries, i.e. in the case of Asia mainly India and China, are more likely to have implemented climate legislation or strategies. This

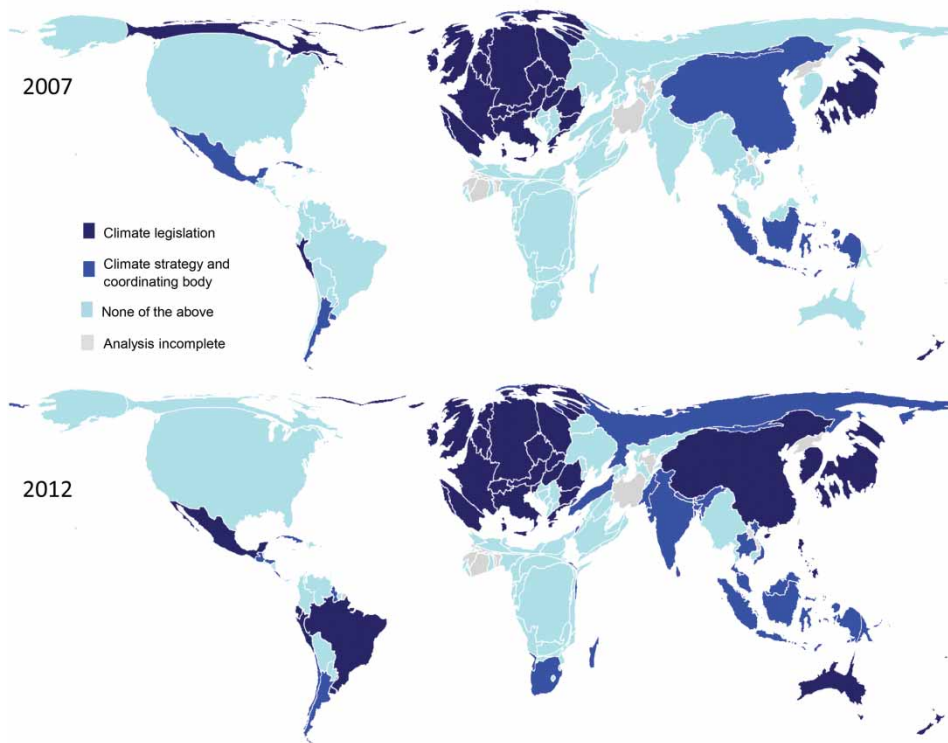


Figure 5 Climate legislation and strategies in 2007 and 2012 (area proportional to cumulative GHG emissions 1970–2010)

is perhaps explained by the likelihood that larger, more populous countries have experienced greater global pressure to introduce climate mitigation strategies.

Figures 3 and 4 illustrate the extent to which current shares of GHG emissions are covered by national climate legislation or strategy. In this map, the area of a country is represented in proportion to its current GHG emissions. Because data are not available for 2012 emission levels, 2010 emission levels are used for both maps (2007 and 2012). It was found that by 2012, a significant and noteworthy share of emissions, i.e. 67% of global emissions, are covered by climate legislation or strategies, while the equivalent figure was 45% in 2007. In particular, the share of emissions under legislation jumped from 15% to 44%, with several countries adopting legislation, including Australia, Brazil, China, Mexico, and South Korea. Notably, Canada, which had a legally binding emissions strategy in 2007, reverted to having no future strategy in place by 2012. The regional trends apparent from Figures 1 and 2 are further reinforced when the data are reported in terms of proportion of emissions covered. Figure 3 shows that the biggest shift in emission coverage between 2007 and 2012 is in the developing world, with emissions from Asia and Latin America in particular coming within the ambit of climate legislation or strategy. In Africa, the number of countries without a climate legislation or climate strategy is high, but their share of emissions, even in aggregate, is low. Taken as a block, by 2012 49% of current emissions from the developing world regions are under climate law and 77% of emissions

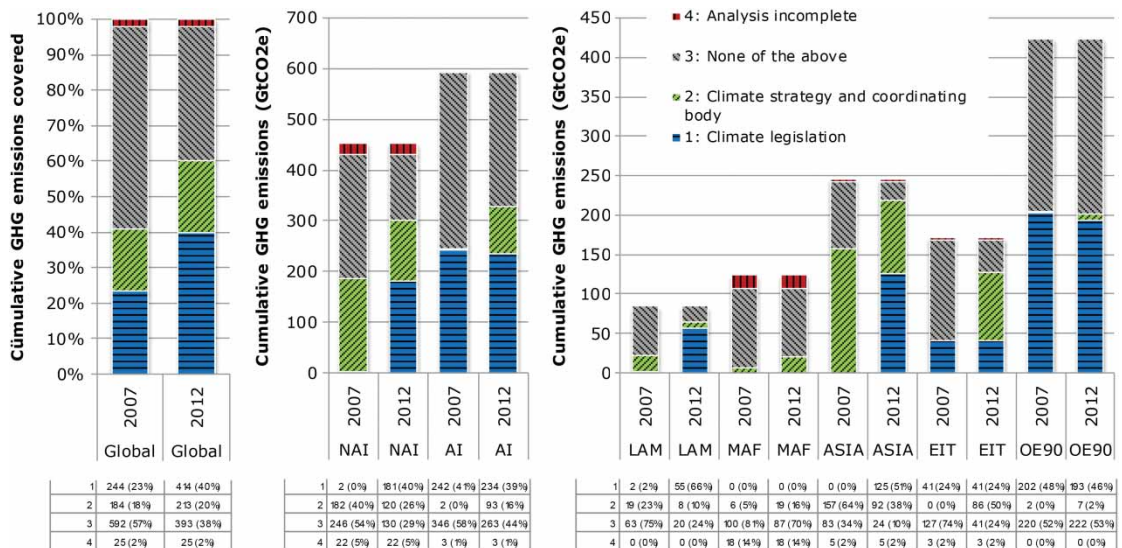


Figure 6 Shares of global cumulative GHG emissions under climate legislation and strategies in 2007 and 2012

are under either law or strategy (Figure 4). The equivalent numbers for the developed world regions are 38% and 54%, respectively.

Figures 5 and 6 provide a view of cumulative emissions from 1970 to 2010.³ Cumulative emissions are often regarded as a relevant indicator for estimating the historical responsibility of countries to act on climate change (BASIC experts, 2011). Here the patterns are similar to the current emissions data but the differences are more pronounced. Figure 6 illustrates that, by 2012, countries from which 40% of cumulative emissions have been sourced are covered by climate law and 60% by climate law or strategies, while the equivalent figures were only 23% and 41% in 2007.

6. Conclusions

This article presents results of a survey of the development of national climate legislation and strategies from 2007 to 2012 covering almost all UN member states. The authors surveyed the existence of nationally binding climate legislation or non-binding climate strategies with a supporting coordinating body for the reduction of GHG emissions without directly assessing their stringency or effect, and without examining subnational action. Examining just national climate legislation or policy is worthwhile because these initiatives can lead to efforts to increase incentives for climate mitigation, serve as a basis for mainstreaming climate objectives into policy making, and become a focal point for the actions of bureaucrats, NGOs, and the private sector, including through shaping norms.

The results of the analysis suggest three broad conclusions. First, there is a significant global trend between 2007 and 2012 toward more climate legislation and strategies. This result is robust, whether the results are sliced by number of countries (23% to 39%), population (36% to 73%), or emissions (45% to 67%).

Second, there is a strong regional effect to the changes, with many of the new developments occurring in the developing world. A substantial proportion of OECD 1990 countries began the period with laws (72%) or strategies (7%) and this inched up only marginally, with laws remaining the same and strategies increasing to 10%. In Asia, the number of countries with legislation increased from 0% to 9% and those with strategies from 9% to 50% between 2007 and 2012. In Latin America, the equivalent figures are 3% to 15% (legislation) and 12% to 18% (strategies). The impact is particularly pronounced in emission terms. By 2012, 62% of Asian emissions were under climate law and 34% under strategies, and in Latin America the comparable figures were 63% and 13%. In fact, by 2012 these numbers were larger than for OECD 1990 countries, where 44% of emissions were covered by law and 3% by strategy. Taken collectively, 49% of current emissions from developing-world regions are under climate law and 28% of emissions are under strategy, while the equivalent numbers for developed-world regions are 38% and 16%.

Third, many more countries are adopting a non-binding climate strategy approach than a nationally binding climate legislation approach. The proportion of countries with legislation increased marginally from 18% to 21%, while the number of countries with strategies increased substantially from 5% to 18%. Notably, because of the dominant effect of new legislation by large countries, including China, during this period, this trend is not observed when the data are sorted by population (10% to 36% increase in legislation and 26% to 37% increase in strategies) or emissions (15% to 44% increase in legislation and 30% to 23% decrease in strategies).

A few different implications may be drawn from these findings, with relevance for future research. It should be recognized that the 2007–2012 period, encompassing the Copenhagen Conference of the Parties in 2009, was one of heightened international debate and negotiation. Although no comparable database exists for any other period, the substantial increase in climate legislation and strategies over this period suggests that the international negotiating process may have exerted some influence, even if indirect. As future data become available, it will be important to understand the linkages between climate negotiations and national climate legislation and strategy.

Additionally, given that climate policy is developing at a variety of levels (national and subnational) and through a variety of ways (climate focus and sectoral focus), it would be useful to more explicitly examine the relevance of the three mechanisms we propose here through which national laws and strategies operate – the creation of incentives, mechanisms for mainstreaming, and focal points for actors. Given the growing prevalence of climate strategies rather than laws in many countries, the extent to which these mechanisms differ in the context of laws versus strategies is particularly worth exploring.

Finally, as stated earlier, the value of research on the existence of climate laws and strategies is enhanced when accompanied by complementary research on the implementation of these laws and strategies. The data reported here comprise one intermediate step, albeit an important one, towards understanding the long causal chain of climate governance.

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Notes

1. A few countries have changed their policy since December 2012, notably the US, and these changes are not reflected in this paper, due to practical difficulties updating the entire data set.
2. European Commission, Joint Research Centre (JRC)/Netherlands Environmental Assessment Agency (PBL). Emission Database for Global Atmospheric Research (EDGAR), release version 4.2. <http://edgar.jrc.ec.europa.eu>, 2011.
3. The year 1970 is used as a start date for two reasons. First, the EDGAR database goes back only to this point, allowing for consistent use of a single data set. Second, as Kanitkar et al. (2010) argue, 1970 is a reasonable estimate of a date on which scientific understanding of the problem developed and, additionally, they argue that a 1970 start date captures a substantial share of differential contributions to cumulative emissions across countries.

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